

# **AEROSOL AND OZONE TRANSPORT: EFFECTS OF FIRES, CONVECTION, AND LIGHTNING**

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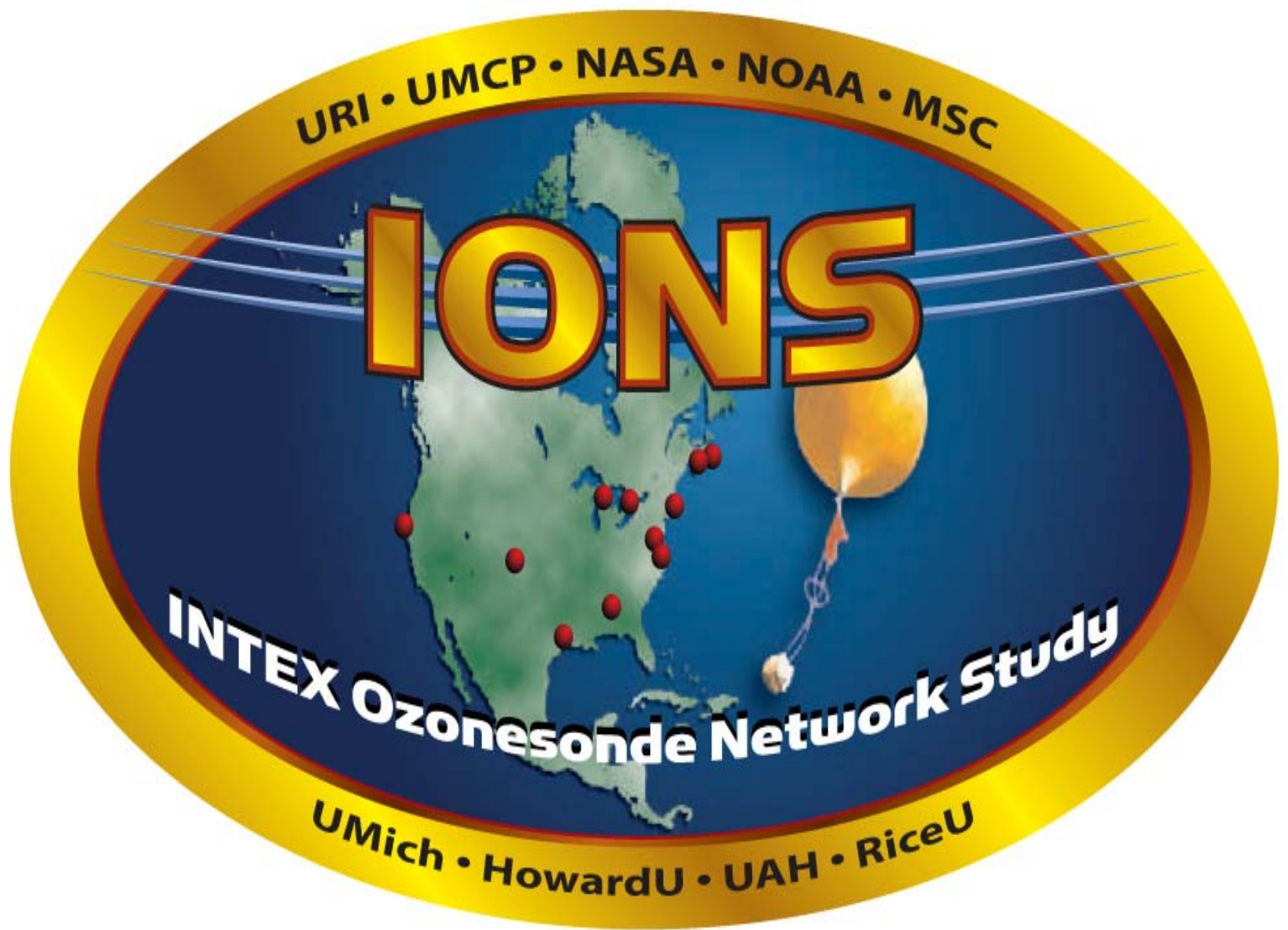
**NASA Ames**

**Rennie Selkirk — Ames**

**Tom Kucsera, Jacquie Witte - Goddard**

# **Trajectories and Trajectory-based Exposure/Influence Products**

- **Back trajectories (5 days) computed from a grid of points in flight area (kinematic and isentropic)**
- **Convective influence – trajectory is run until intersects deep convective cloud (based on GOES-IR imagery); location influenced, storm location and elapsed time displayed**
- **Lightning exposure – NLDN flashes accumulated along trajectories**
- **Aerosol exposure – TOMS Aerosol Index accumulated along trajectories**
- **Aircraft emission exposure**
- **Stratospheric influence – PV reverse domain fill product**

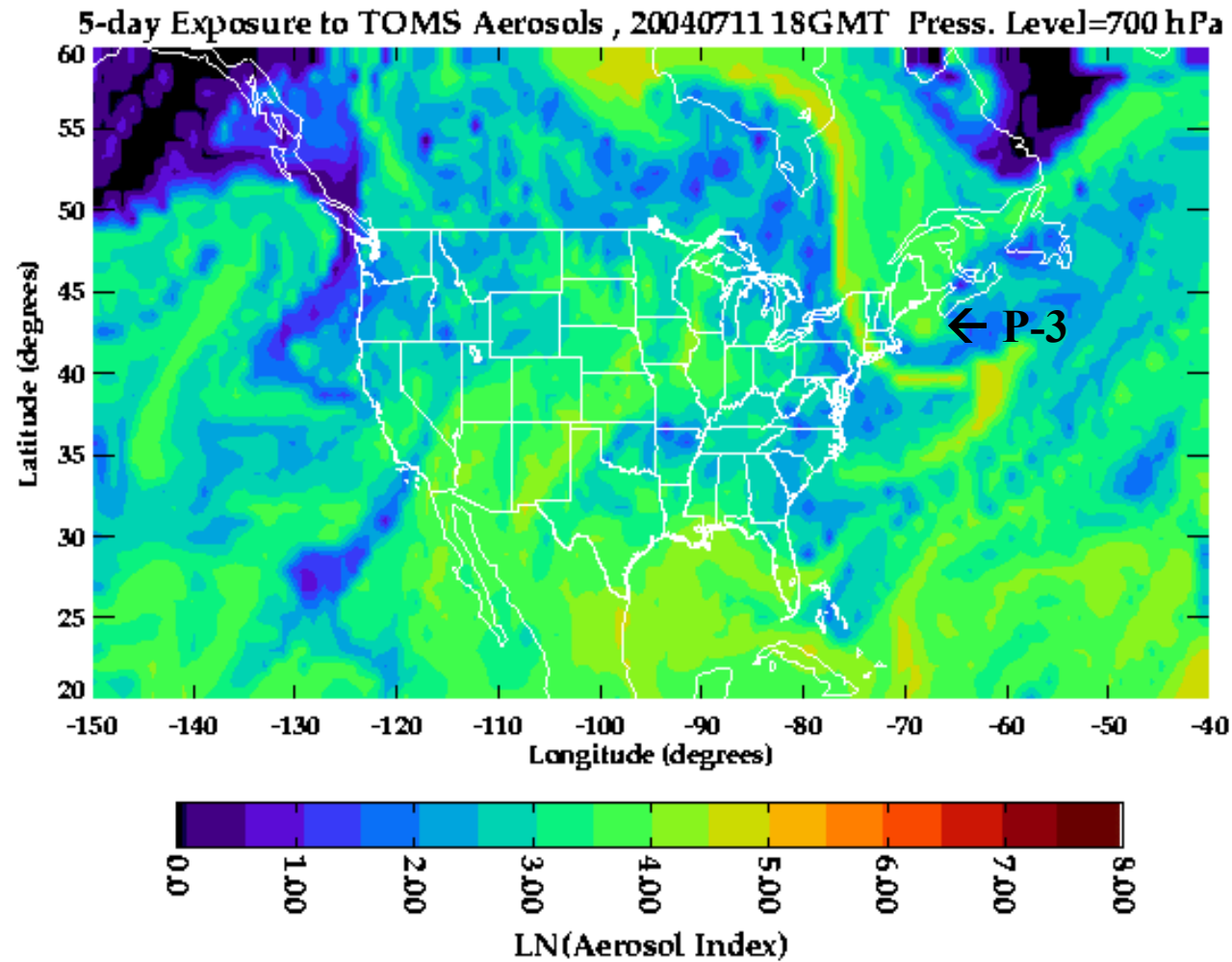


See poster by Anne Thompson focusing on Ron Brown ozonesondes

# **Alaska/Yukon Fire Influence Based on TOMS Aerosol Index**

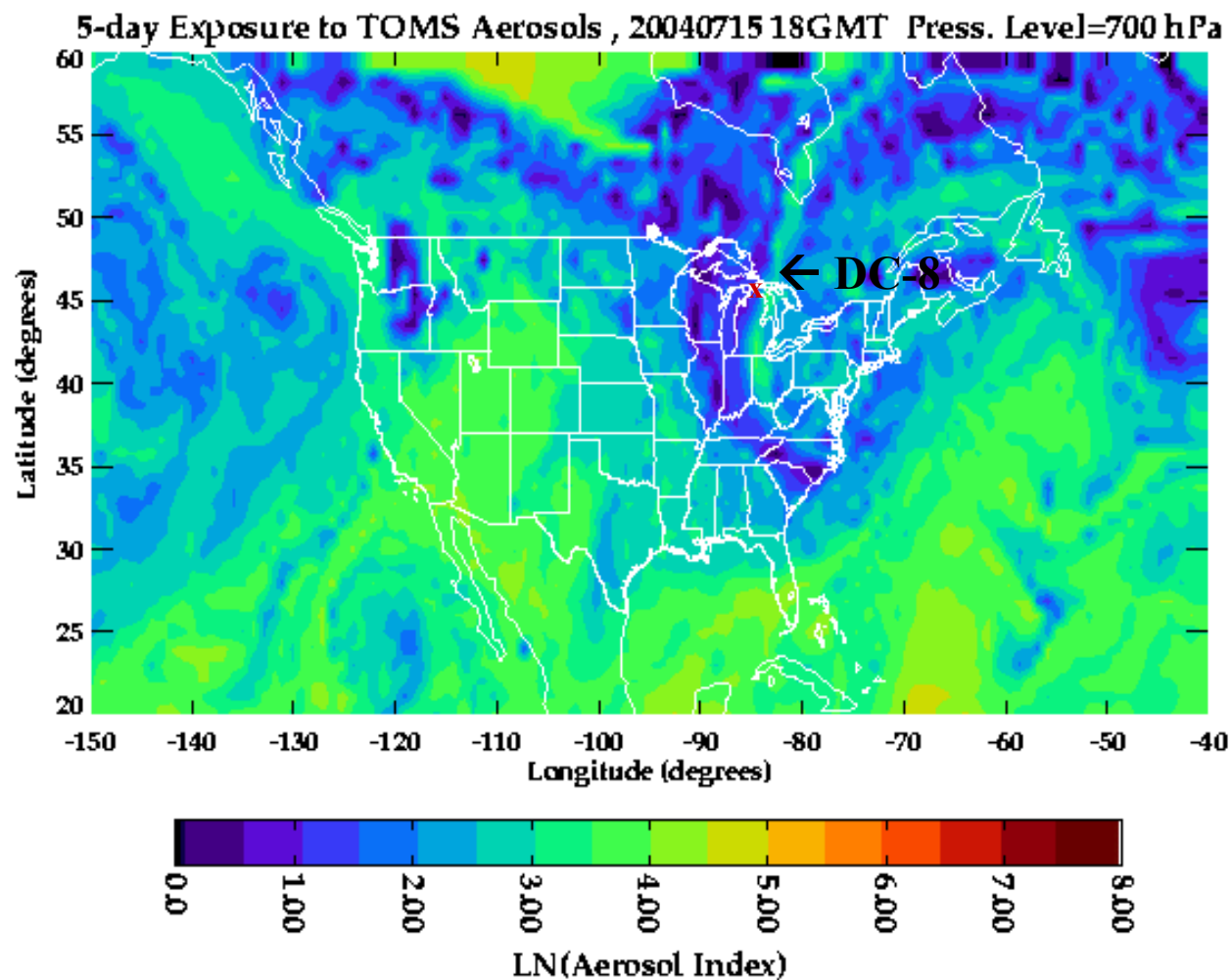
- **July 6 - first noted in Central/Eastern Canada**
- **July 9 and 11 – present on NOAA P-3 flights in Gulf of Maine**
- **July 15 – detected over Northern Michigan by DC-8**
- **July 18 – DC-8 entered major plume near Newfoundland**
- **July 20 – DC-8 encountered plume over AL, and again in the Northeast**
- **July 22 – Layers evident along Atlantic coast**

## NOAA P-3 Encountered Smoke over Gulf of Maine



NAS A/GSFC/916/kinetic/TK

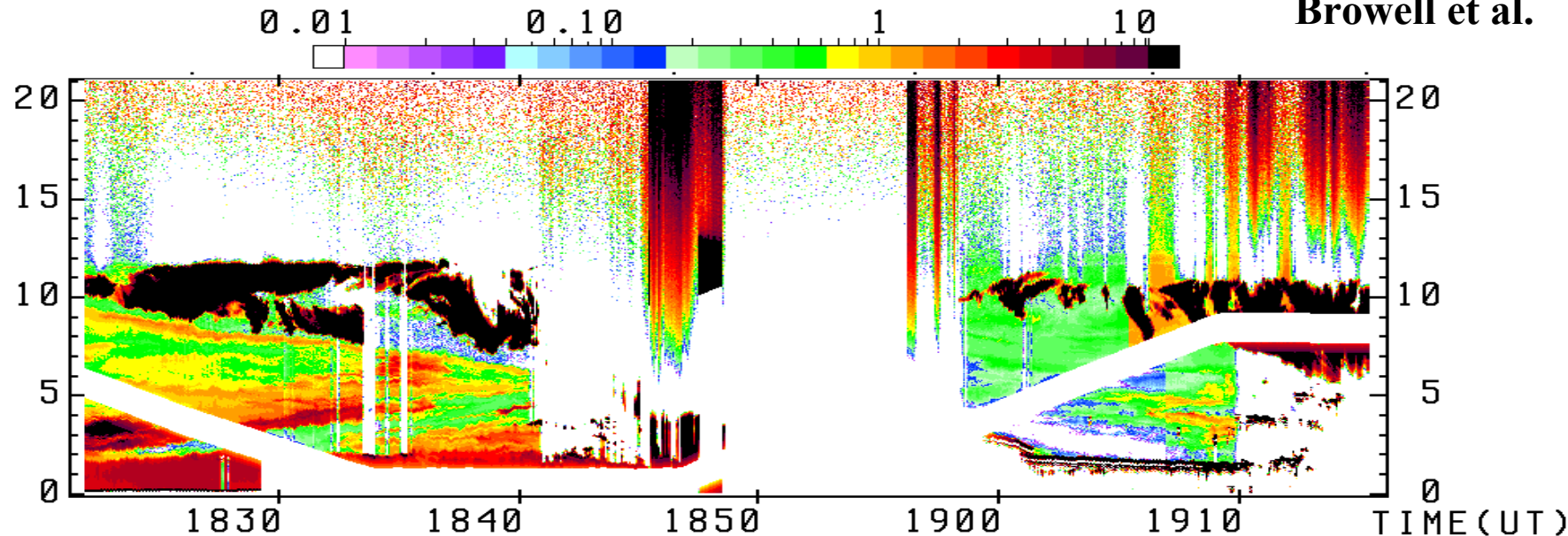
## NASA DC-8 and Pellston, MI Ozonesonde Note Fire Plume



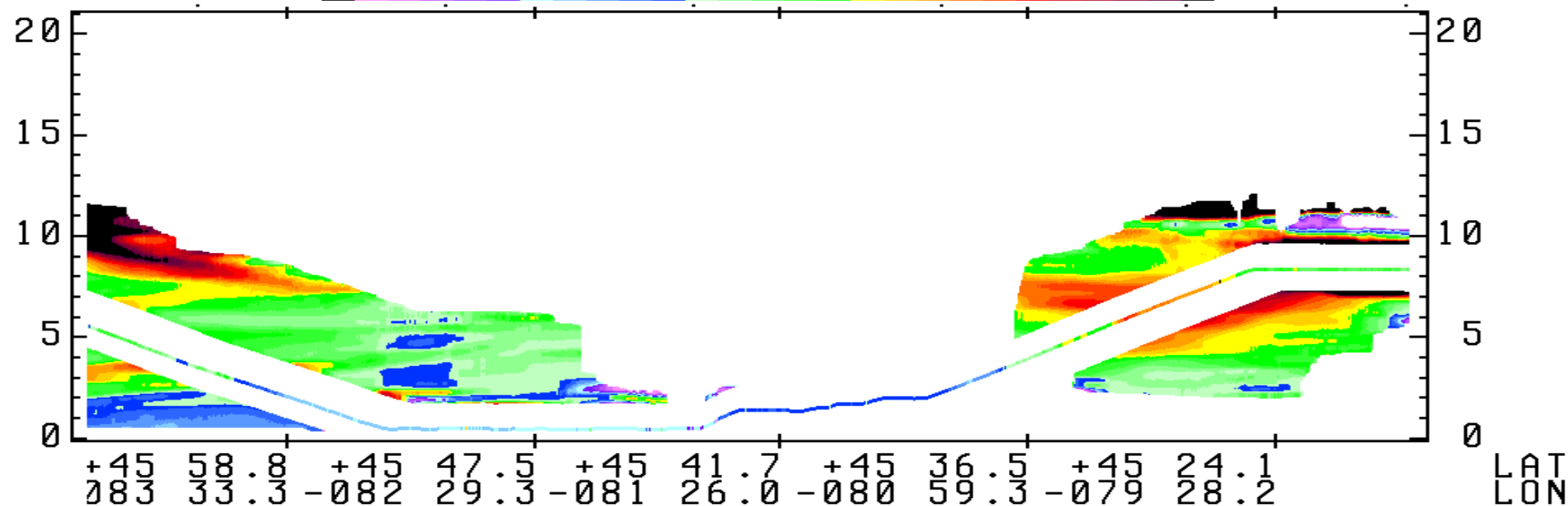
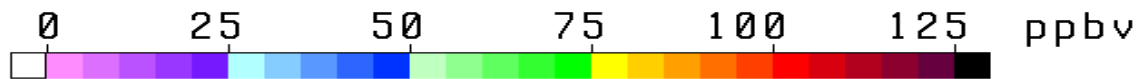
NAS A/GSFC/916/kinetic/TK



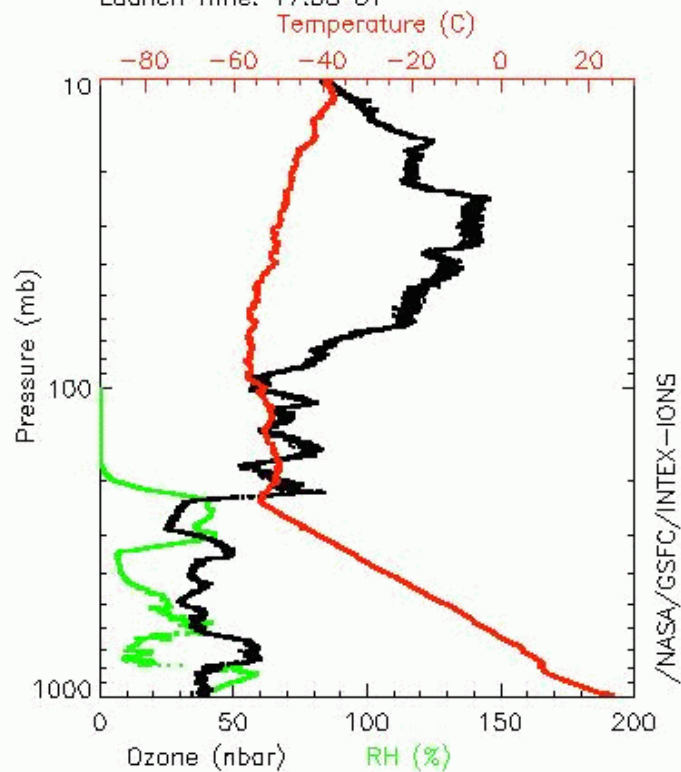
ALTITUDE (KM)



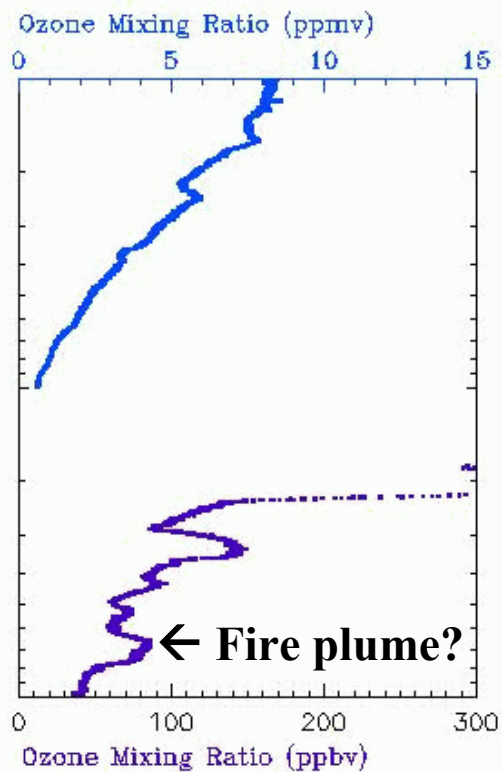
OZONE MIXING RATIO



INTEX-IONS Site: Pellston, MI (46N, 85W)  
Launch Date: 15 July, 2004  
Launch Time: 17:55 UT

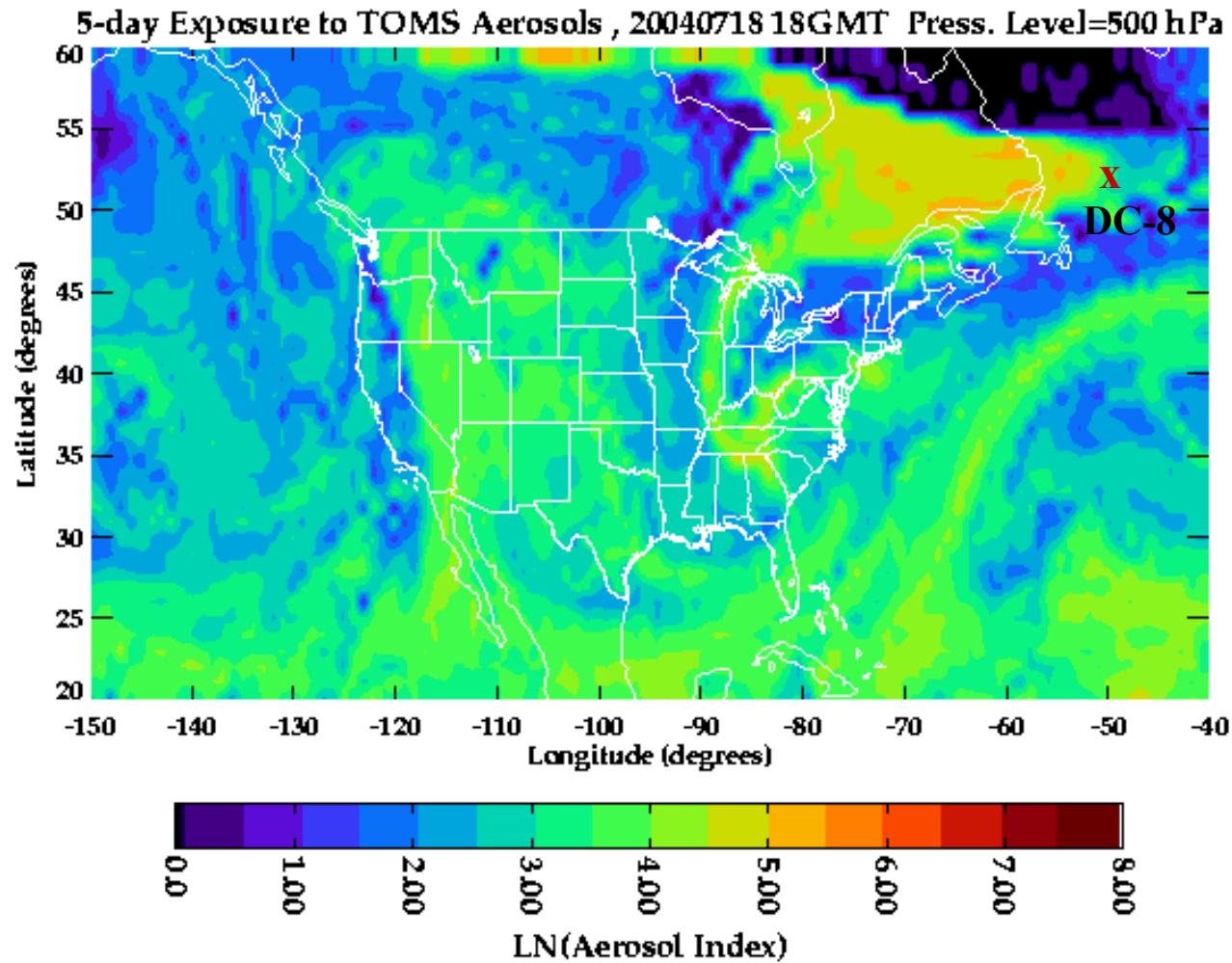


T03 (SBUV) = 343( 43)  
T03 (CMR) = 360( 60)



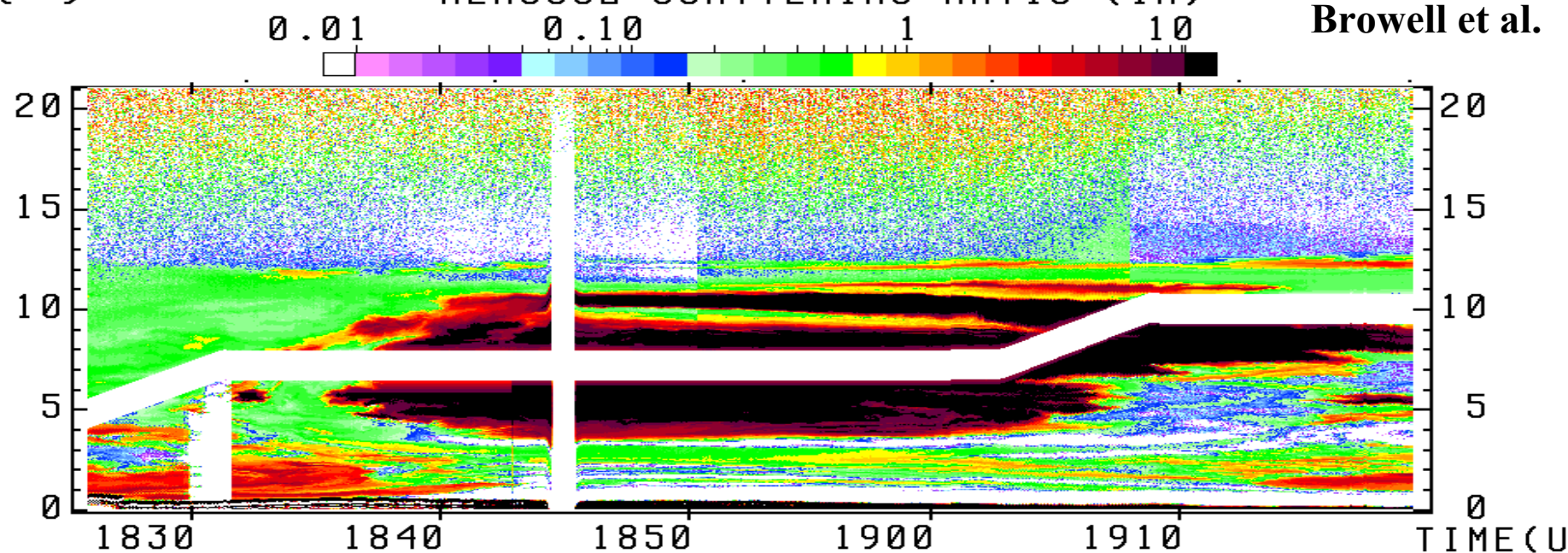


# NASA DC-8 Encounters Large Plume NE of Newfoundland



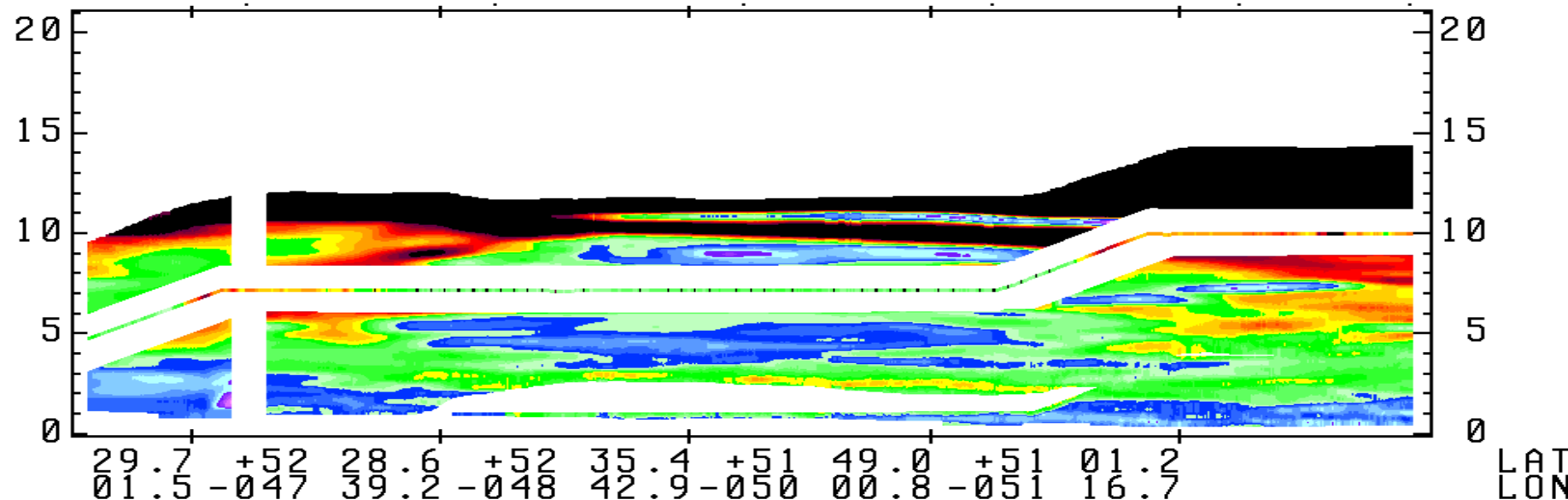
NAS A/GSFC/916/kinetic/TK

ALTITUDE (KM)

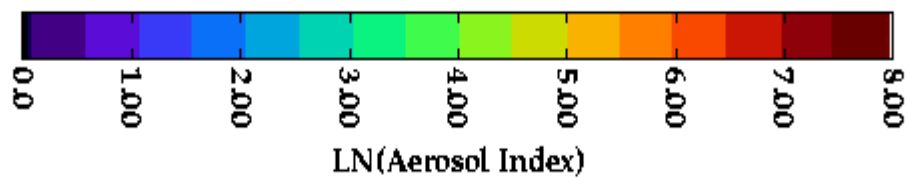
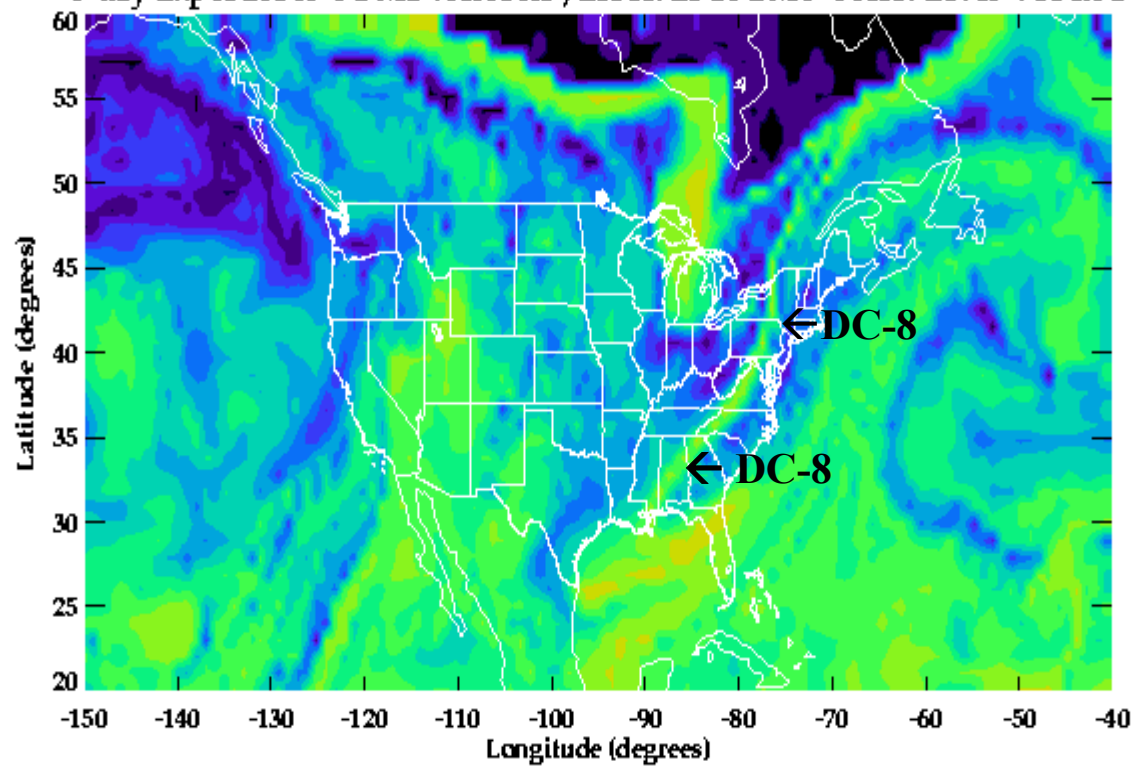


OZONE MIXING RATIO

0 25 50 75 100 125 ppbv

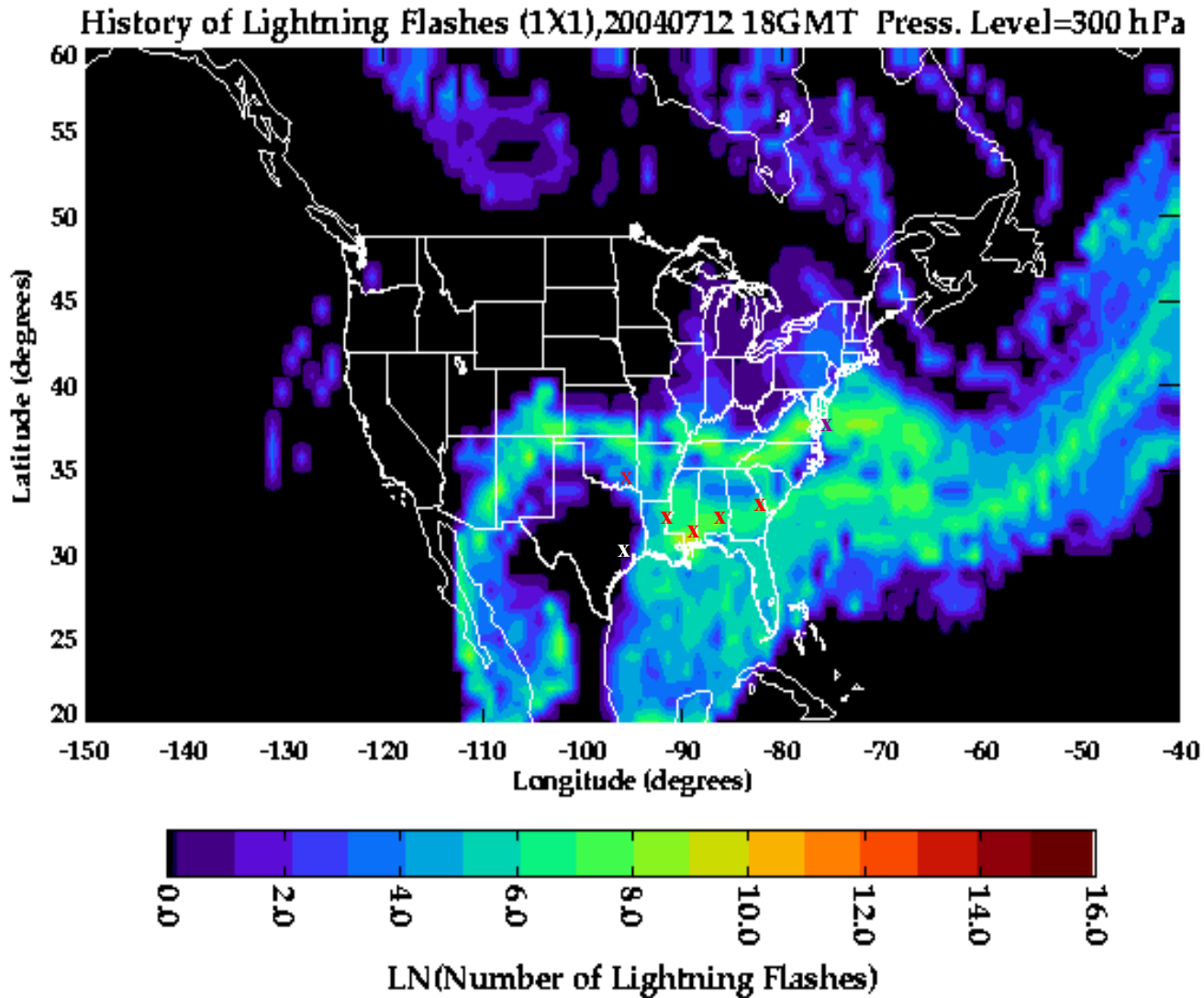


5-day Exposure to TOMS Aerosols , 20040720 18GMT Press. Level=700 hPa



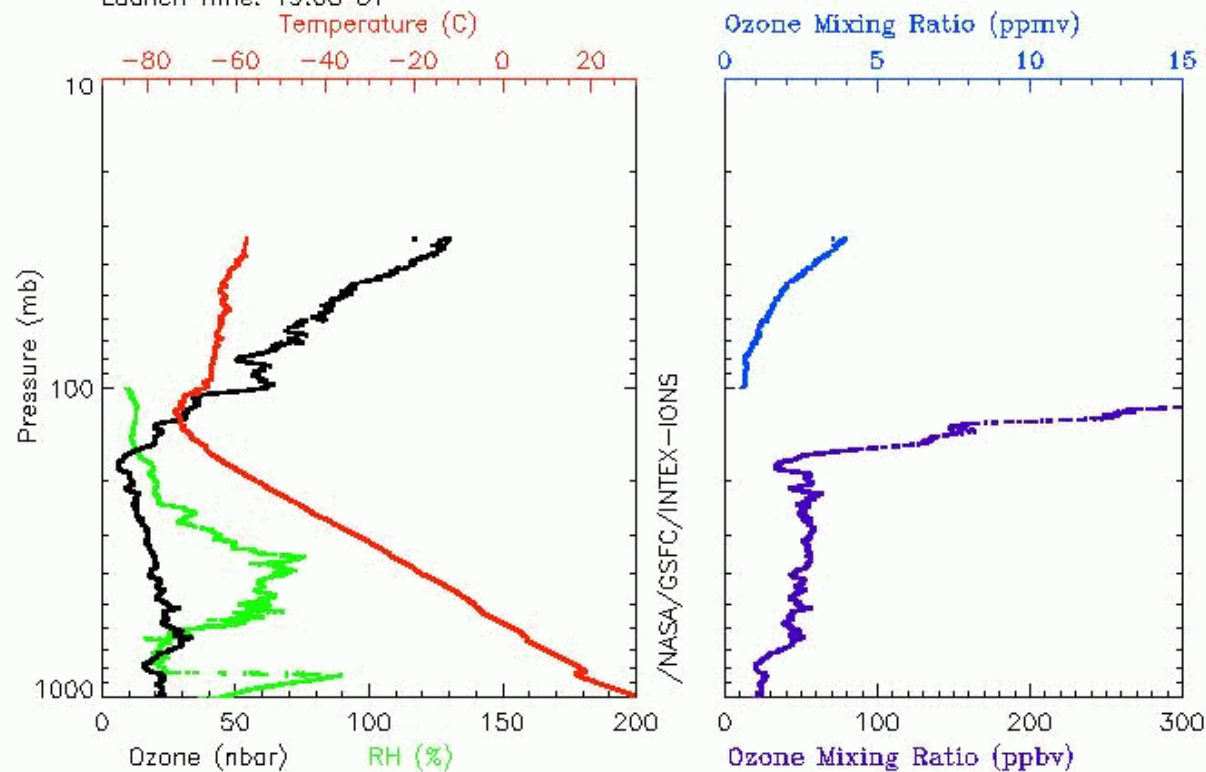
NAS A/GSFC/916/kinetic/TK

## Good correspondence of 5-day lightning influence and enhanced UT ozone



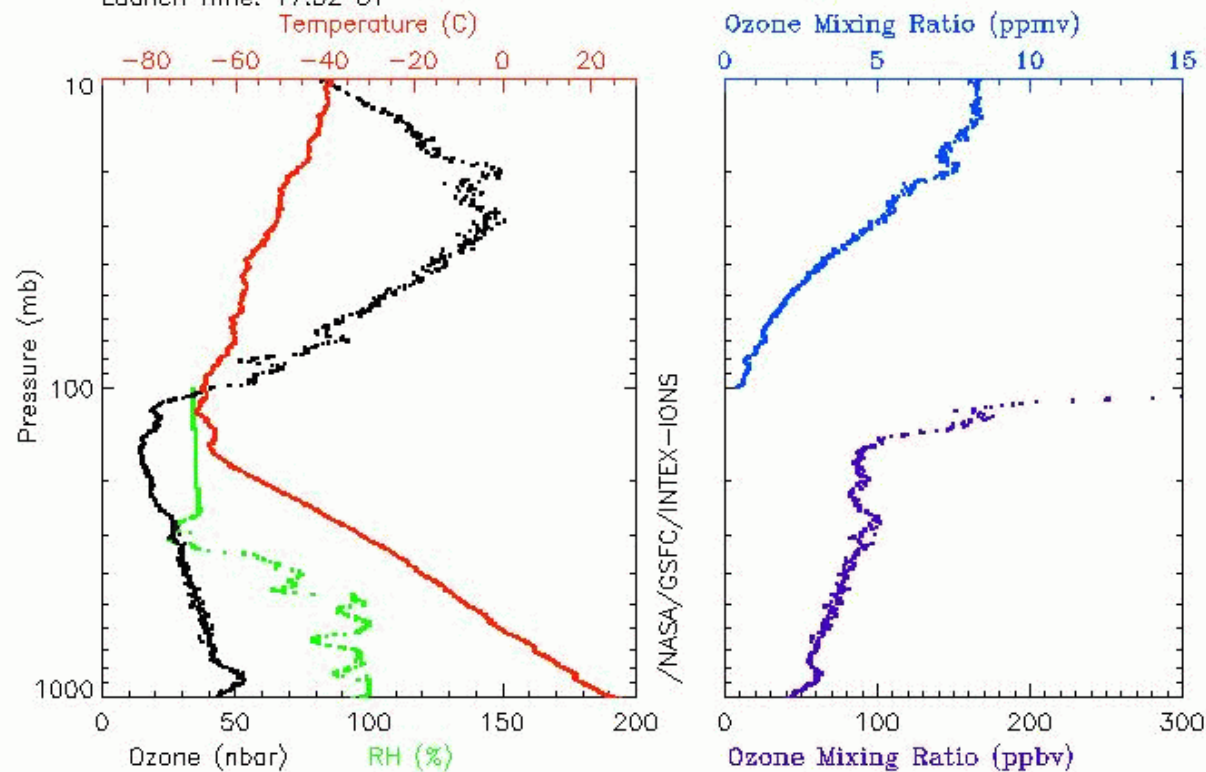
INTEX-IONS Site: Houston, TX (30N, 95W)  
Launch Date: 12 July, 2004  
Launch Time: 19:00 UT

T03 (SBUV) = 999(999)  
T03 (CMR) = 999(999)



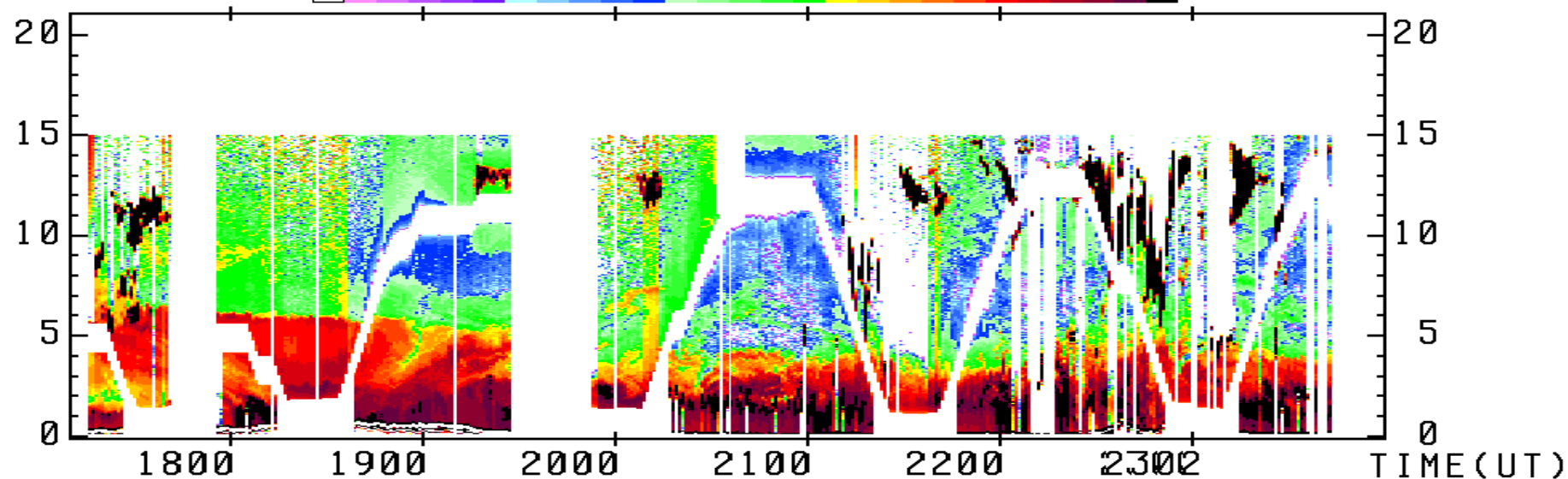
INTEX-IONS Site: Wallops Is, VA (38N, 76W)  
Launch Date: 12 July, 2004  
Launch Time: 17:32 UT

T03 (SBUV) = 309( 42)  
T03 (CMR) = 321( 54)

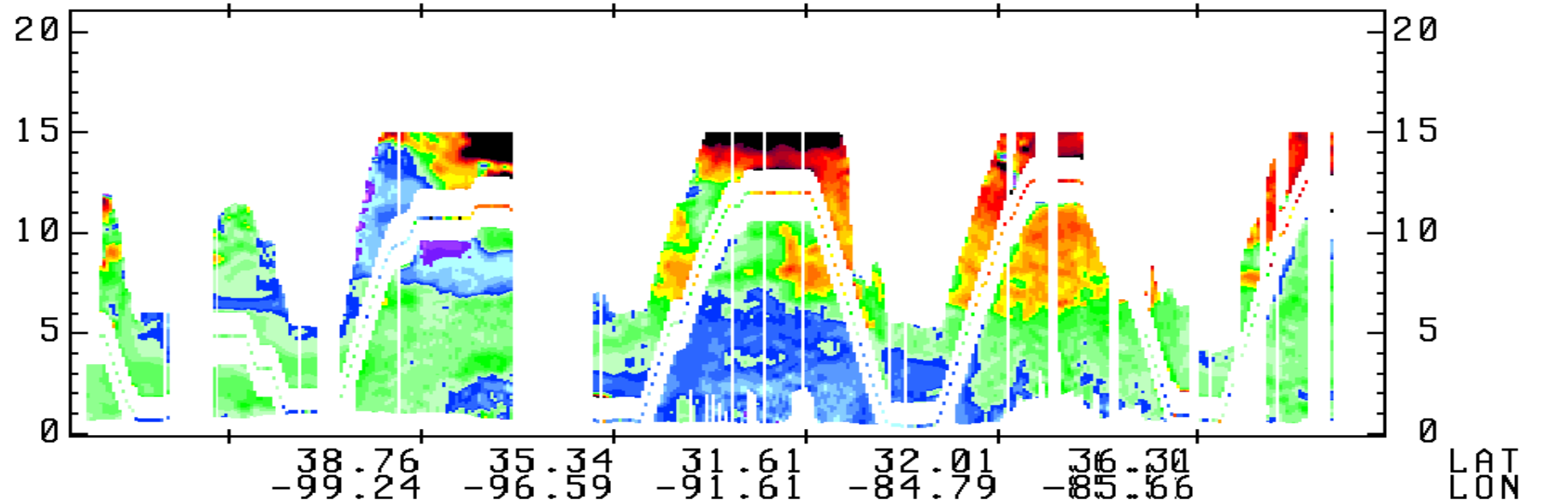




ALTITUDE (KM)



ALTITUDE (KM)



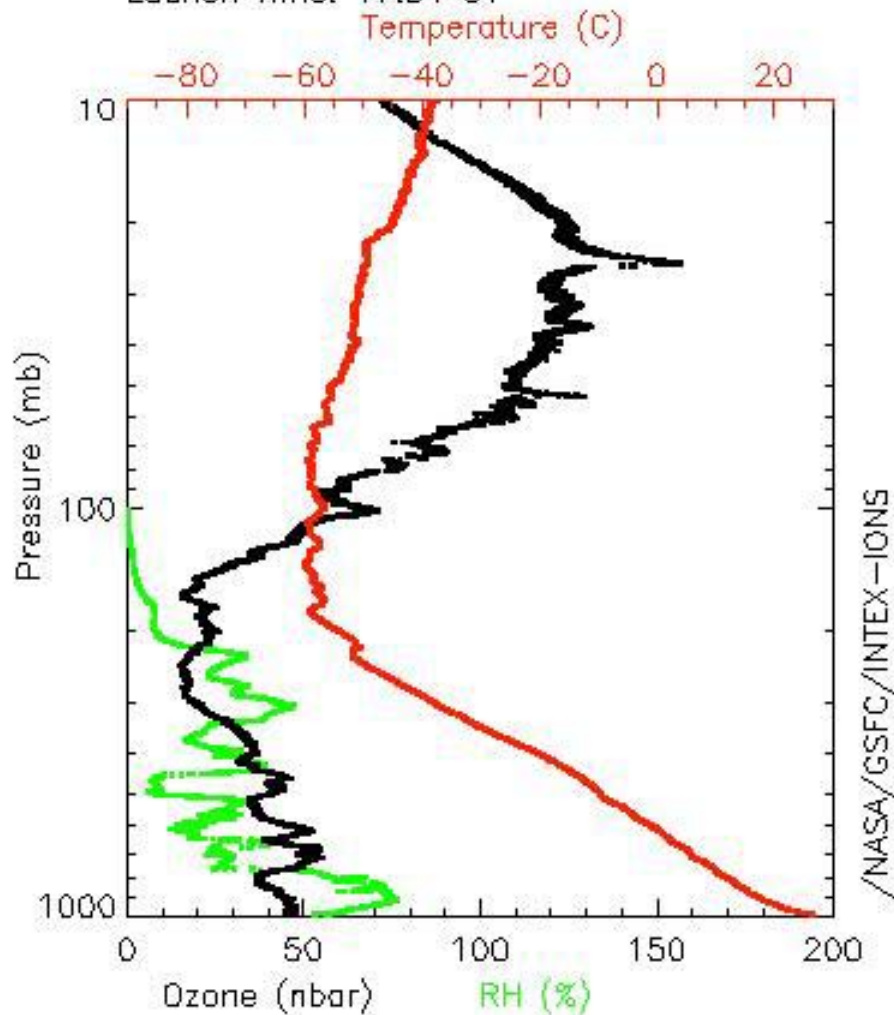


# **SUMMARY**

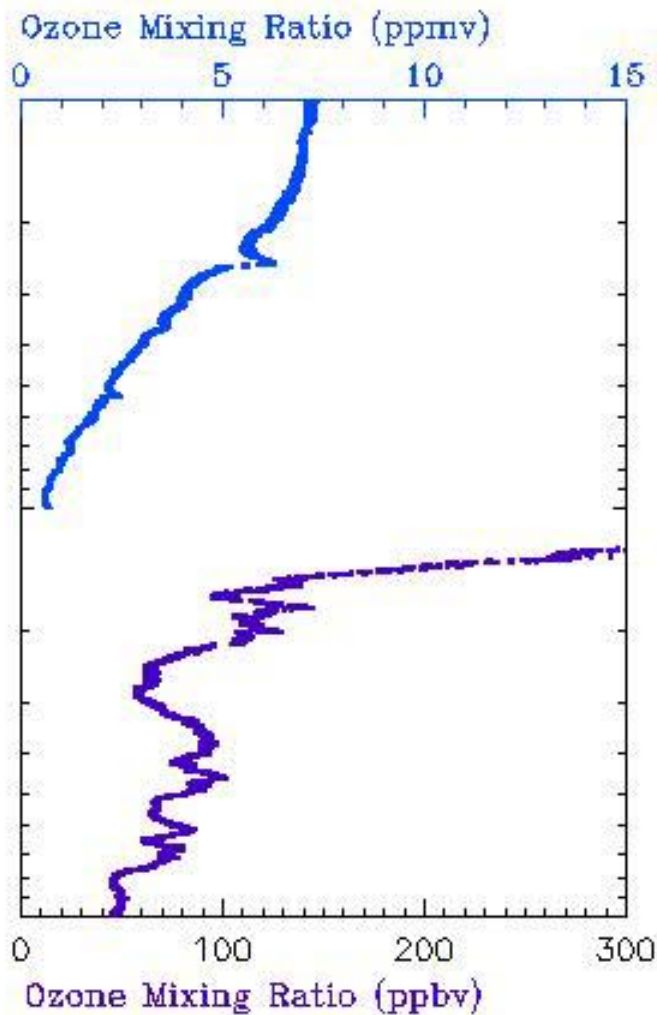
- **Aerosol exposure based on TOMS AI has provided depictions of Alaskan/Yukon fire plume locations for flight planning**
- **Accumulation of lightning influence well correlated with enhanced UT ozone**
- **INTEX ozonesondes and associated trajectories aid in flight planning, diagnosis of effects of convective outflow, Asian pollution transport**

## Possible Asian Influence on Mid- and Upper Tropospheric Ozone

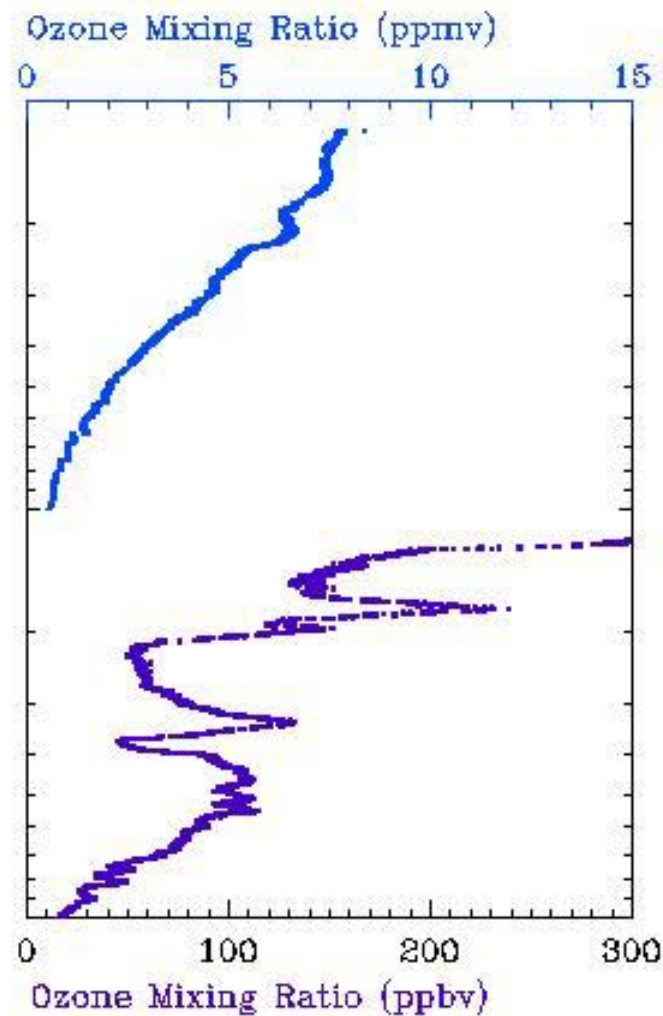
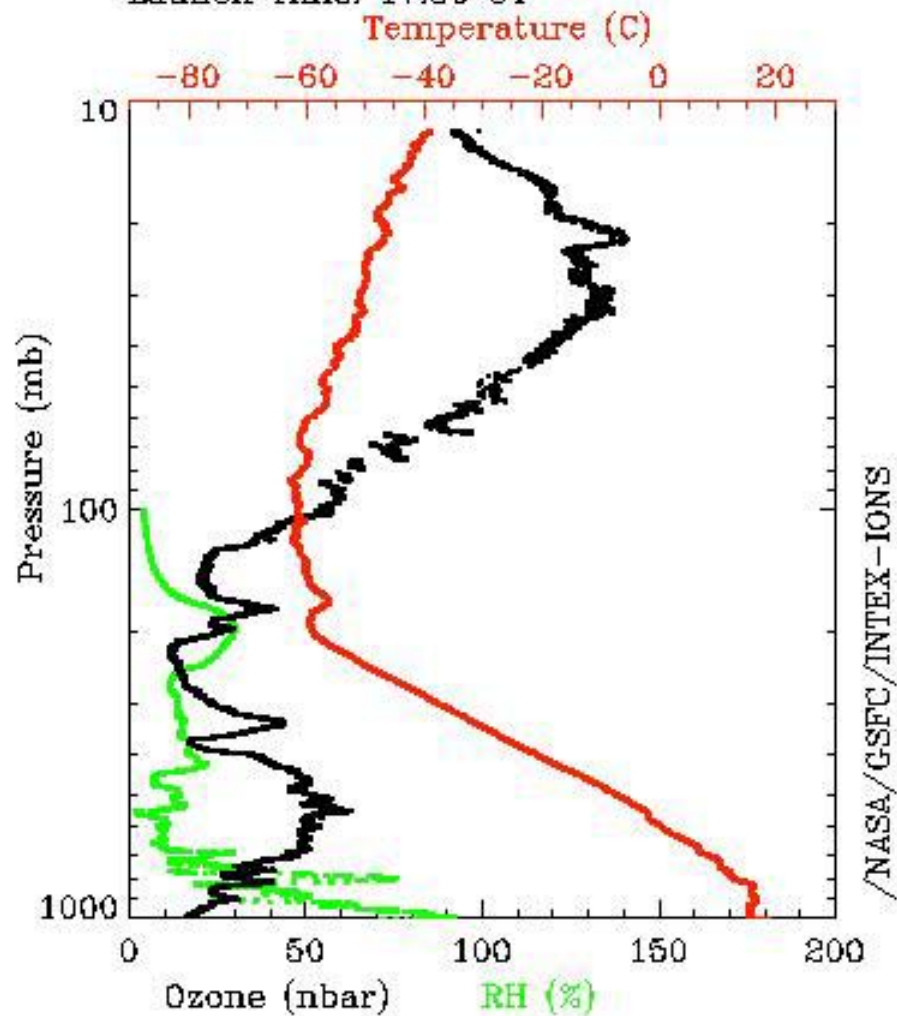
INTEX-IONS Site: Pellston, MI (46N, 85W)  
 Launch Date: 20 July, 2004  
 Launch Time: 17:54 UT



T03 {SBUV} = 300( 44)  
 T03 {CMR} = 307( 51)



INTEX-IONS Site: Trinidad Head, CA (41N, 124W) TO3 (SBUV) = 297( 60)  
Launch Date: 20 July 2004 TO3 (CMR) = 310( 73)  
Launch Time: 17:50 UT



INTEX-IONS Site: Trinidad Head, CA (41N, 124W)  
4-Day Back Trajectories  
Start Date: 20 July, 2004, 1800 UT

	Initial Press,	End Press
850mb,	551.248	
700mb,	541.378	
500mb,	347.894	
350mb,	259.548	
250mb,	211.493	

